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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/998,993	11/15/2001	Michael Turner	M-12396 US	9456

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09/25/2002

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EXAMINER

MALDONADO, JULIO J

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 09/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/998,993

Applicant(s)

TURNER ET AL.

Examiner

Julio J. Maldonado

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 November 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-13 and 17-20 is/are rejected.
- 7) ☒ Claim(s) 4, 5 and 14-16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 6-13 and 17-20 rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. (U.S. 6,426,015 B1) in view Lin et al. (U.S. 6,100,202).

In reference to claims 1-3, 6-8, 10-13, 17, 18 and 20, Xia et al. (Figs.1-2) in a related method to deposit a doped silicon dioxide layer (34) teach the steps of preheating a wafer (12) to a preheat temperature; introducing a dopant precursor gas having a dopant precursor gas flow rate and a silicon-containing gas having a silicon-containing gas flow rate, wherein a ratio of the dopant precursor gas has an initial value; increasing the ratio from the initial value during a initial time period, wherein said increasing depends on the wafer temperature; maintaining the ratio at the final value during a final period, wherein during the initial period and the final period the dopant precursor gas and the silicon-containing precursor gas react in the plasma to form the doped silicon dioxide layer on the wafer having about the same dopant concentration during the final period; and etching one or more contact holes (36) through the doped silicon dioxide layer (34) having straight sidewalls (column 4, line 45 – column 6, line 13).

Xia et al. fail to teach the steps of providing a dopant precursor gas comprising phosphine (PH_3) or diborane (B_2H_6) and a silicon-containing precursor gas comprising silane (SiH_4); and applying plasma conditions on the precursor gases. However, Lin et al. (Figs.3-7) in a related method to deposit a layer of doped silicon dioxide (44) teach the steps of providing a dopant precursor gas comprising phosphine (PH_3) and diborane (B_2H_6) and a silicon-containing precursor gas comprising silane (SiH_4); and applying plasma conditions on the precursor gases (column 8, lines 18-39 and column 9, lines 10-39). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use phosphine or diborane as precursor gases under plasma conditions as taught by Lin et al. in the silicon dioxide formation method of Xia et al., since it would avoid voids in the oxide layer during an etching process (column 5, lines 51-57).

In reference to claims 9 and 19, Xia et al. in combination with Lin et al. substantially teach all aspects of the invention but fails to show that the preheat temperature is 350°C , the initial value of the ratio is about 0.49 and the final value of the ratio is about 0.77. However, the selection of the claimed ranges is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious).

Allowable Subject Matter

3. Claims 4-5 and 14-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. The following is a statement of reasons for the indication of allowable subject matter: Xia et al. (Figs.1-2) in a related method to deposit a doped silicon dioxide layer (34) teach the steps of preheating a wafer (12) to a preheat temperature; introducing a dopant precursor gas having a dopant precursor gas flow rate and a silicon-containing gas having a silicon-containing gas flow rate, wherein a ratio of the dopant precursor gas has an initial value; increasing the ratio from the initial value during a initial time period, wherein said increasing depends on the wafer temperature; maintaining the ratio at the final value during a final period, wherein during the initial period and the final period the dopant precursor gas and the silicon-containing precursor gas react in the plasma to form the doped silicon dioxide layer on the wafer having about the same dopant concentration during the final period; and etching one or more contact holes (36) through the doped silicon dioxide layer (34) having straight sidewalls (column 4, line 45 – column 6, line 13)..

However, Xia et al. neither teach nor suggest measuring a concentration of dopant incorporated into a portion of a silicon dioxide layer as a function of the ratio for a first series of test depositions performed at a constant temperature; repeating the measurement of dopant concentration for a second series of test depositions performed

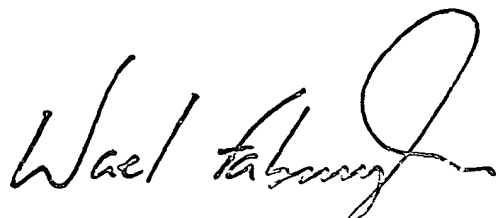
at a different constant temperature; and measuring a temperature profile of the wafer during a third test deposition wherein the temperature is not held constant.

Conclusion

Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (703) 308-4918.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.



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